A COMPARATIVE STUDY BETWEEN CORROSION PROTECTION OF DIFFERENT SUBSTITUTED Pt-METALLOPORPHYRINS

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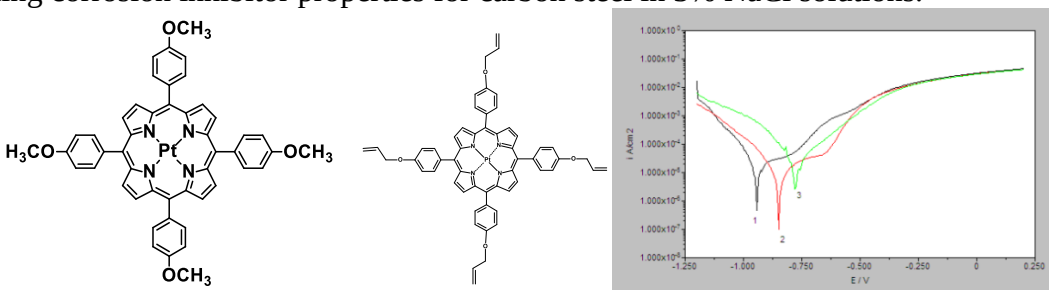
Organic compounds containing N, S and O heteroatoms, and / or aromatic or other π-electronic systems, exhibit excellent potential for corrosive protection. The porphyrin molecule, by its extended aromatic structure promises to be a potential corrosion inhibitor due to its strong binding ability to metal surfaces.The metal present in the metalloporphyrins inner core presents as good adsorption properties as porphyrin-base molecules. [1]. The current investigation presents the comparative results of two different substituted Pt-porphyrin compounds (**Figure 1**), namely: Pt(II)-5,10,15,20-tetra(4-methoxy-phenyl)-porphyrin (Pt-TMeOPP) bearing inductive donor methoxy groups and Pt(II) -5,10,15,20-tetra-allyloxyphenylporphyrin (Pt-TAPP), that is grafted with electron withdrawing allyloxy groups regarding corrosion inhibitor properties for carbon steel in 3% NaCl solutions.



a) b) c)

Figure 1. a) Porphyrin (Pt-TMeOPP), b) (Pt-TAPP) structures and c) potentiodynamic polarization curves for carbon steel after 60 min. immersion in 3 % NaCl solutions without (1) and with porphyrins: Pt-TMeOPP (2) and Pt-TAPP (3), scan rate = 1 mV/s.

The Pt-TMeOPP molecule satisfies the criteria of an effective inhibitor and can form a protective layer on metal surface (cover properly the active centers of the metal surface) avoiding the aggressive species to reach to the metal surface. The Pt-TMeOPP shows good anticorrosive protection to iron in saline solution. The polarization resistance increase from 53.9 Ohm (iron in saline media) to 1271 Ohm in the presence of this metal porphyrin. The corrosion rate is 0.10 mm/year less than 0.26 mm/year for iron in saline solution and 0.48 mm/year for Pt-TAPP. Thus, Pt-TAPP has not provided a suitable anticorrosive protection due to peripheral functional group, steric hindrance and electron density at donor reaction sites that affect the binding stability to metal surface. This Pt-porphyrin appears to form a thin, porous and incomplete layer on iron surface resulting in inefficient protection.

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References
[1] K.S. Lokesh, M. de Keersmaecker, A. Adriaens. Molecules 17 (2012) 7824.